

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FOREST SITE PREPARATION

(Acre)

CODE 490

DEFINITION

Treating areas to improve site conditions for establishing a forest.

PURPOSES

- Encourage natural regeneration of desirable woody plants.
- Permit artificial establishment of woody plants.

CONDITIONS WHERE PRACTICE APPLIES

On all lands where establishment of woody plants is desired.

CRITERIA

General Criteria Applicable to all Purposes

The method, intensity and timing of site preparation will match the limitations of the site, equipment, and the requirements of the desired woody species.

An appropriate site preparation method will be chosen to protect any desirable vegetation.

A cultural resources review and field inspection in accordance with NRCS policy will be conducted for any site preparation method considered to be an undertaking.

Remaining slash and debris shall not create habitat for or harbor harmful levels of pests.

Remaining slash and debris shall not hinder needed equipment operations or create undue fire hazard.

Soil compaction and displacement will be minimized. Sites with slopes in excess of 8 percent should not be prepared with a conventional bulldozer blade or root rake due to the erosion hazard.

All chemicals will be applied in accordance with label guidelines.

Erosion and/or runoff will be controlled. Soil disturbing methods should be done on the contour.

Comply with applicable federal, state, and local laws and regulations during the installation, operation, and maintenance of this practice including the state's Forest Practices Guidelines.

Species best adapted to the soils and sites being reforested should be selected. See woodland suitability interpretations for soil series, Section II-B Technical Guide (Soil Interpretations Record) for trees to manage and trees commonly found on that soil. Also refer to the standard for Tree/Shrub Establishment (Code 612).

The following table shows the recommended horizontal widths in feet for forested filter strips (Streamside Management Zones - SMZ's) between the bottom of site-prepared area and stream or lake.

	% Slope of Adjacent Lands				
	0-5	6-10	11 - 20	21 - 45	46+
Stream or Waterbody Type	SMZ Width Each Side (feet)				
Intermittent	50	50	50	50	50
Perennial	50	50	50	50	50
Perennial, Trout waters	50	66	75	100	125
Public water supplies (streams / reservoirs)	70	70	90	130 -210	210 -300

NOTE: These are recommended minimum widths. Under given condition and need combinations, the responsible manager will want to expand or contract the distances yet fully protect the stream channel and water quality. SMZ width is measured along the slope in linear feet on each side from the edge of the pond, lake or stream to the toe of the road, skid trail, or other surface disturbance.

CAUTION: Extra care is recommended within SMZs near public water supplies (streams and reservoirs) to reduce the risk of sudden and severe contamination problems due to failure of BMPs during unusual storms.

Piles and windrows should be kept as narrow as possible and on the contour. Soil should be kept

out of windrows so surface water will pass through and not develop channels which cause gully erosion. Leave breaks in windrows at least every 300 feet.

Sites having slopes in excess of 8 percent should not be prepared with a conventional bulldozer or root rake due to the erosion hazard.

Burns should be made as soon after logging or chopping as weather conditions permit.

Burns made just ahead of direct seeding expose seed to mice and birds; so seed should be treated with protective chemicals.

Beds should be at least 5 inches above original ground level after settling and planting. Width of beds will vary according to type of equipment used; distance between centers of bed will be from 10 to 12 feet.

The area to be bedded must be sufficiently free from logging debris and vegetation so a well-shaped bed free of air pockets can be formed. Beds should be sufficiently high to elevate seedlings above standing water. Beds should be oriented to channel water into vegetated surfaces. Forestry bedding must comply with wetland best management practices.

Water control should be designed to maintain an optimum water table. In the flatwoods, pines grow best when the water table is at least 18 inches but less than 36 inches below the surface.

Additional Criteria to Permit Artificial Establishment of Woody Plants

Many areas will not require site preparation where pine species are being planted. Some exceptions are:

1. Heavy grass sod or ground cover:

Disking and furrowing can be specified where a dense grass sod or rank growth of grasses, legumes, or weeds (e.g. bermudagrass, carpetgrass, fescue, broomsedge) are present. A herbicide may also be needed. Furrows can be plowed with a moldboard, middle-buster or special fire-line plow, 2" to 4" deep, and at least 20" in width. The sod can also be removed by "scalping" spots about 15" to 20" across with a mattock or heavy hoe where trees are to be planted. Scalping should be just deep enough to prevent regrowth of vegetation. Install furrows on the contour to reduce erosion. Furrowing should be done 2 to 3 months prior to planting to let rains settle the loose soil. Seedlings should be planted in the furrows, except where the water table is

close to the surface. Light sandy soils should not be furrowed. Survival usually is improved, but because topsoil is removed, growth is reduced. Disking and furrowing usually are not needed in light sod. In excessively drained upland soils, seedlings should be planted in furrows up to 3" deeper than they grew in the nursery except for longleaf pine, which should be planted with the base of the bud at ground level and the root collar completely below ground (for hand planted seedlings).

2. Heavy brush or shrubs:

Apply foliage spray, disk, or plow according to the size and type of undesirable brush or shrubs. On slopes exceeding 9 percent, disking or plowing should be done on approximate contours on strips 3 to 4 feet wide, leaving alternate strips undisturbed. Kudzu or honeysuckle can be controlled according to methods described in the standard for Forest Stand Improvement (Code 666).

3. Cottonwood and Sycamore:

Prior to planting cottonwood and sycamore, the land should be prepared by breaking and/or disking to the degree that a clean, cultivable seedbed is provided.

4. Critical areas with severe sheet erosion, gullies, or with topsoil removed - Treat by planting cover crops, fertilizing, and mulching prior to planting. For further details, consult the specifications for Critical Area Planting (Code 342), Section IV of the Technical Guide.

Additional Criteria to Encourage Natural Regeneration - Preparing Sites for Natural Seeding

A. Seed Source

An adequate seed supply must be present for natural seeding. Site preparation measures to encourage natural seeding should be employed only with light-seeded intolerant species whose seed are wind-disseminated. This includes the native pines, cottonwood, and yellow poplar. Most of the heavy-seeded, tolerant hardwoods will reproduce satisfactorily with fire and grazing excluded. After establishment, desirable seedlings should be released, where necessary, from competing undesirable species.

Seed trees should be dominant trees of good quality. The following table shows the number of pine seed trees needed to

produce enough seed and also provide enough volume to attract a logger when reproduction is established and the seed trees are removed. They also provide insurance against loss to lightning and windthrow.

**Minimum Recommended Number of
Pine Seed Trees/Acre**

DBH	Shortleaf	Loblolly	Longleaf	White
10	20	12	55	12
12	14	9	38	9
14	12	6	28	6
16+	12	4	21	4

CONSIDERATIONS

The chosen method should be cost effective and protect cultural resources, wildlife habitat, threatened and endangered species, water resources and identified unique areas.

There is no all-purpose site preparation technique. Soil, terrain, existing or expected moisture conditions, vegetative cover, method of regeneration, size of tract, equipment and available capital must be considered. Large industrial landowners with conversion plants can afford to use much more intensive methods than small landowners. Use caution in adopting costly practices before results are evident. Methods of site preparation which minimize land disturbances are encouraged.

Site preparation can be inexpensive or very costly. It can be as simple as prescribed burning or as involved as shearing, plus root raking, and windrowing or burning, plus disking, bedding, and drainage. The best method depends upon the owner's objective.

Visual quality objectives should be considered when selecting site preparation methods.

Anticipate possible off-site effects and modify the site preparation design accordingly.

Consider safety of personnel during site preparation activities.

Site preparation can be successfully practiced in all forest types. Site preparation is needed to reduce or eliminate competing vegetation such as grass, low-quality hardwoods, and vines, or improve moisture conditions (too wet, too dry) which retard or prevent the establishment of desirable species by natural or artificial means.

Consider wildlife needs by leaving food and cover vegetation within the area. Bottomland along streams may be left in an undisturbed

condition because of its high value as wildlife habitat.

"A Guide for Predicting Sheet and Rill Erosion on Forest Land, SA-TF-11" can be used to calculate soil loss from site prepared areas.

Preparing Sites for Planting - Methods

A. Chopping and Burning

Drum chopping and fire, used in combination, are effective and soil-conserving methods of site preparation. Improved access and visibility increase efficiency and enhance the safety of planting operations. Chopping with a large drum-type brush cutter pulled by a crawler tractor does a good job on areas where hardwood trees are less than 8 inches in diameter. Best results are achieved when chopping is done from late spring until late summer, when brush is in full leaf, and area is burned after several weeks have elapsed. Dead leaves clinging to the brush will carry a hot fire across the area.

For bigger material, a larger diameter rolling chopper puts more pressure on the blades with less drag than tandem and tandem offset drum choppers. For smaller stems the tandem drum chopper has greater cutting action. When choppers are used in an offset (angled) configuration, the roots are also displaced, again reducing sprouting under most conditions. Cutting action increases with speed, so choppers should be operated as fast as safety permits. When the ground is soft, chopping is less efficient because the anvil action of firm soil is missing.

B. Bulldozing

1. K/G Blade

The K/G or shearing blade is generally preferred in heavy stands of pole-size trees, predominantly over 8 inches in diameter, too large for disking or drum chopping. Trees are sheared at ground level and piled in windrows.

Shearing blades are angled or U-shaped, have straight or serrated edges and have a "stinger" for splitting larger trees and stumps.

The blades have a flat sole to allow "floating" on the surface of the ground without digging.

2. V-Blade

A V-blade may be used where small trees, brush, or sod hinders mechanical planting. V-blades are often attached in front of small crawler tractors that pull a tree planting machine. Thus the site is prepared and planted in a one-pass operation. V-blades are commonly used where longleaf pine is mechanically planted on sites that have been treated with chemicals to kill small hardwoods.

3. Root Raking and Bulldozing

The conventional earth-moving blade may also be used in pole-size stands. Trees are uprooted and windrowed which unduly disturbs the soil and is generally costlier than working with a K/G blade.

Both root raking and bulldozing have shortcomings -- considerable topsoil ends up in the windrow; non-productive time is spent backing away from windrows, and extra traffic compacts the soil.

C. Disking

Disking is usually an additional treatment to an area that has already been chopped, burned, or bulldozed. A large offset disk and crawler-type tractor are required. Root systems down to about 10 inches are turned up to dry. Best results are obtained in the hot months of later summer and early fall. In areas of light brush, disking alone may serve as adequate site preparation. On flat, moderately well drained to poorly drained soils, disking can be used to form beds on which to plant, thereby increasing growth and yield. (Note: disking is rarely recommended because of the amount of soil disturbance.)

D. Rotary Brush Cutters

Small brush up to about 2 inches in diameter, briars, and other small vegetation may be satisfactorily controlled with a heavy duty rotary cutter. August and September are generally the preferred months.

Large trees are frequently left standing in areas prepared by the above methods because it is more economical to eliminate them by other means. Use of the metering type tree injector as described in the standard for Forest Stand Improvement (666) is the preferred method to eliminate large undesirable trees.

E. Prescribed Burning

Prescribed fire is a valuable supplement to some forms of mechanical or chemical

control of competing vegetation. Burning before planting, seeding, or natural seeding reduces logging debris and heavy litter. Some drawbacks to prescribed fire are:

1. Local or state ordinances/laws may prevent burning during part or all of the year.
2. Fires may be erratic on sites with minimum litter.
3. Used alone, it will seldom provide lasting benefits--vegetation requires repeated burning, and it must be used skillfully for safe and effective results.

Nevertheless, fire is the simplest and least expensive method of site preparation. Burning must be done under the supervision of a qualified and trained individual. Refer to the standard for Prescribed Burning (Code 338).

F. Chemicals

1. Sprayers

Foliage sprays can be used. Small areas should be tried before any large scale operations are undertaken. See the standard for Forest Stand Improvement (Code 666).

2. Stem Treatment

Chemicals may be injected into stems of trees by the use of injectors or by frilling or notching. This method can eliminate scattered large trees following mechanical methods. Areas with large numbers of stems may prove too costly for this method alone. Refer to the standard for Forest Stand Improvement (Code 666).

G. Bedding

Bedding is used to modify drainage on wet sites, thereby improving survival and growth of planted seedlings.

H. Water Control

Ditches designed to follow the natural drainage pattern are the least expensive method of removing excess water. Flashboard risers can be used to retain water on-site.

I. Fertilization

Fertilization can be considered an operational practice only in the poorly drained savannas, flatwoods, and other soils (including organic soils), of the Coastal Plains that are generally deficient in phosphorus.

Logging operations will, in many instances, expose sufficient mineral soil for adequate reseedling. There will, however, be many areas where heavy sod, brush, and other vegetation will retard or prevent restocking of the desired species. These sites will need to be prepared by either mechanical or chemical means or by prescribed burning. The kind of site preparation needed should be determined by an on-site examination of the area. The type of combinations of site preparation needed will depend upon the expected seed crop and the species of pine. The important point is that most natural regeneration in the South has resulted in too much stocking, rather than too little. For best results, all site preparation measures should be carried out in the summer prior to seed fall.

Natural seeding is prevented or retarded in many cases by wildfire and overgrazing. If either of these factors is determined to be the reason for the lack of reproduction, consideration should be given to the construction of fences and firebreaks.

Site preparation of natural hardwood stands can be done usually at one time only - after a "clearcut" (usually at least ten acres in size) is made to regenerate a stand. After all merchantable trees are cut from the area, site preparation consists of killing or removing the remaining cull, undesirable and unmerchantable trees down to 2 inches in size. Intolerant light-seeded species such as yellow poplar, sycamore, and sweetgum require a mineral soil seedbed to become established. Oaks and hickories must be present as advance reproduction to successfully compete in the "clearcut" area.

PLANS AND SPECIFICATIONS

Specifications for applying this practice and protection of the site shall be prepared and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, references to enclosed plans from other agencies, or other acceptable documentation. The use of approved job sheets is encouraged where available.

Minimum documentation for this practice includes:

- Species to be planted or established
- Method of site preparation and planting
- Equipment to be used
- Copy of forest management plan approved by a registered forester.
- Statement requiring compliance with all federal, state, and local laws.
- Operation and maintenance requirements.

If the use of pesticides is referenced in materials provided to the landowner, the following statement will be included:

"Specific pesticides recommendations will be obtained from personnel who are licensed by the NC Department of Agriculture and Consumer Services in specialty area Forest Pest Control - Category G - in accordance with North Carolina Pesticide Laws and Regulations."

"Note: All pesticides must be registered for use in North Carolina and approved for use by the U.S. Environmental Protection Agency (EPA). Refer to the current issue of "North Carolina Agricultural Chemicals Manual" prepared by the College of Agriculture and Life Sciences, North Carolina State University, for guidelines, rules and regulations regarding use of pesticides. Users must always follow instructions and safety precautions on the container label when handling, applying, or storing pesticides."

Site preparation on gullied areas, other critical areas, and highly erosive soils must be done with care. These areas should be identified and specific plans prepared for the site preparation activities.

OPERATION AND MAINTENANCE

- Repair erosion control measures as necessary to ensure proper function.
- Access by vehicles during site preparation or after (i.e., before adequate tree and shrub establishment occurs) should be controlled to minimize erosion, compaction, and other site impacts.